

Inadvertent Autopilot Engagement during Takeoff on A220 Aircraft



Several in-service events were reported to Airbus where the flight crew inadvertently selected the autopilot while attempting to engage the autothrottle during the takeoff roll. Inadvertent autopilot engagement may result in early rotation that can lead to a tail strike, inability to climb, runway overrun, or even loss of control.

The purpose of this article is to describe the circumstances leading to this type of event with a case study and to provide details about the procedure updates and planned product enhancements that aim to prevent recurrence.

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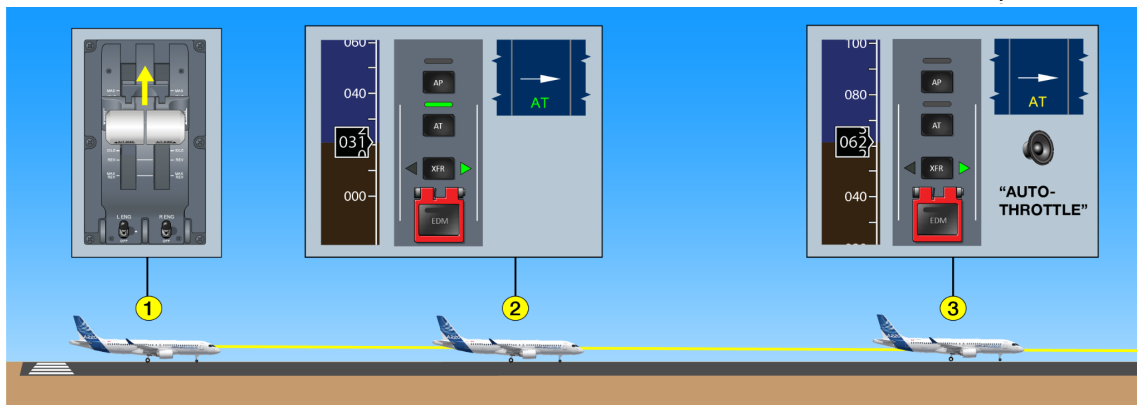
CASE STUDY

Event Description

An A220 aircraft was aligned on the runway and ready for a flap 2 and TO-3 derated takeoff. The computed takeoff speeds were 135 kt for V1, 137 kt for VR, and 141 kt for V2. The autothrottle was armed (**fig.1**).

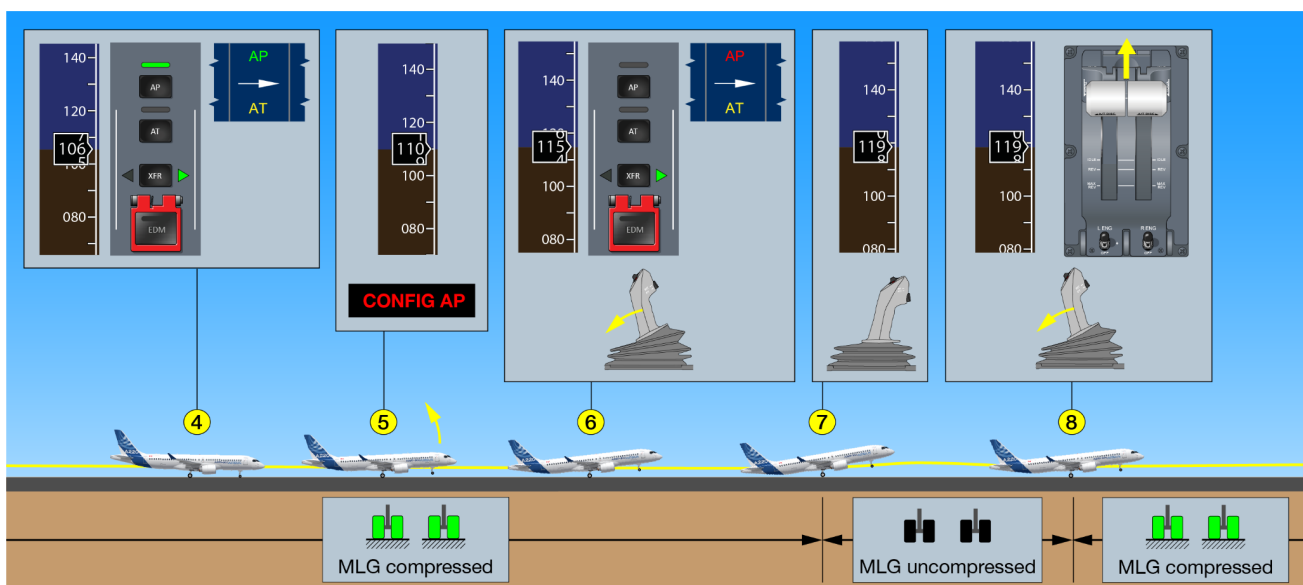
① The flight crew moved the thrust levers forward to initiate takeoff. ② The autothrottle engaged at approximately 31 kt and the takeoff thrust (81.5% N1) was reached at approximately 40 kt. ③ At 62 kt, the autothrottle unexpectedly disconnected, accompanied by the “**AUTOTHROTTLE**” aural alert.

(fig.1) illustration of the event - part 1



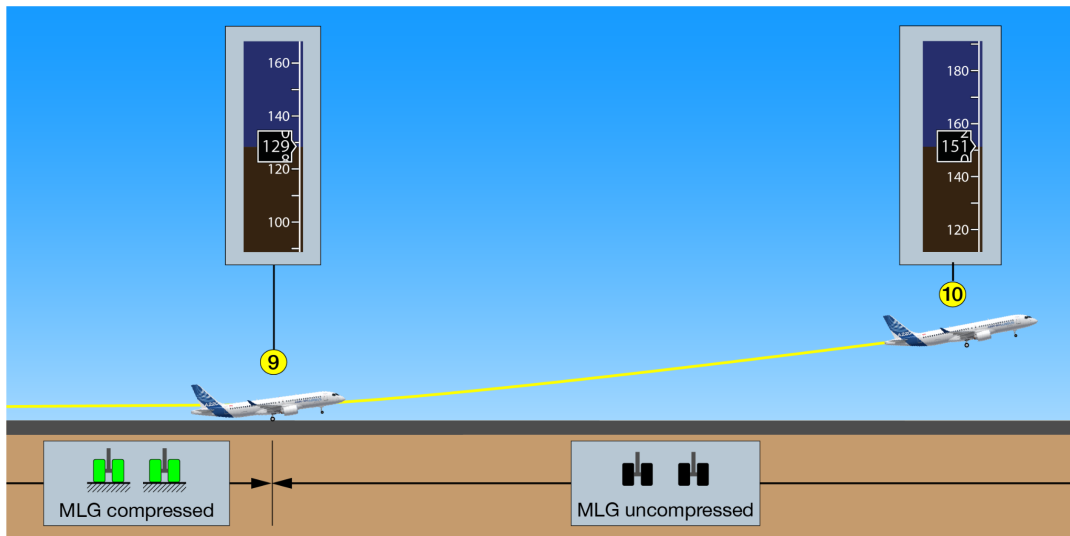
④ At 106 kt, the flight crew wanted to re-engage the autothrottle but they pressed the autopilot AP switch instead of the AT switch on the Flight Control Panel (FCP). ⑤ The **CONFIG AP** EICAS alert triggered at 110 kt (VR- 27 kt), but without the associated “**CONFIG AUTOPILOT**” aural alert as the “**AUTOTHROTTLE**” aural alert was still repeating. With the AP engaged, the aircraft started to rotate. ⑥ At 115 kt (VR-22 kt), the PF disconnected the autopilot and briefly applied 66% backstick input before releasing the sidestick to neutral. ⑦ At 119 kt (VR-18 kt), the aircraft pitch reached 10.7 ° and the strut of the main landing gear decompressed. ⑧ 1s later, the landing gear was compressed again and the aircraft pitch reduced slightly to 7.5 °. The captain (PM) pushed the thrust levers to MAX and the first officer applied 50% backstick inputs.

(fig.2) illustration of the event - part 2



⑨ The landing gear decompressed again when the aircraft reached 129 kt (VR-8 kt) and began to climb. ⑩ The aircraft reached 151 kt (V2 + 10kt) at 100 ft RA. The flight crew deactivated the repetitive “**AUTOTHROTTLE**” aural alert and continued the flight.

(fig.3) Illustration of the event - part 3



Event Analysis

Inadvertent selection of the autopilot

When the autothrottle unexpectedly disconnected during the takeoff roll, the flight crew tried to manually reengage it using the autothrottle switch, but they inadvertently pressed the autopilot switch instead. This caused the autopilot to be engaged with the aircraft still on ground.

Autopilot commanded rotation

The autopilot commanded a pitch-up when it was inadvertently activated on the ground to reach the flight guidance pitch target. This caused the aircraft to rotate too early when the aircraft was still 27 kt below VR.

No "CONFIG AUTOPILOT" aural alert

The "CONFIG AUTOPILOT" aural alert did not sound, because the repetitive “**AUTOTHROTTLE**” aural alert was still active when the **CONFIG AP** EICAS alert was triggered.

Reduced Tailstrike Margin

During the event, at step ⑦, the aircraft pitch attitude was 10.7° when the aircraft was still on the ground, which corresponds to a tailstrike margin as low as 1 to 2 ft.



OPERATIONAL CONSIDERATIONS

The A220 FCOM and AFM were updated and the red OEB 001 was published to provide procedures and information to flight crews with the aim to raise awareness and prevent any unintentional selection and engagement of the autopilot during the takeoff roll if attempting to select and engage the autothrottle.

No autothrottle selection during takeoff roll

The flight crew must not attempt to select and engage the autothrottle during the takeoff roll. This will reduce the risk of unintentional selection of the autopilot switch.

As a reminder, the autothrottle selection pushbutton on the FCP is inhibited above 60 kt when the HOLD Mode activates and remains inhibited until reaching 400 ft AGL.

Managing autothrottle disconnect during takeoff

A220 FCOM 2 “Normal Procedures - Normal takeoff / High wind takeoff, Step (3) Autothrottle” was updated to provide flight crews with a procedure if the autothrottle disconnects during the takeoff roll.

Autothrottle disconnect below 60kt

If the autothrottle disconnects below 60 kt, the flight crew must abort takeoff.

Autothrottle disconnect above 60 kt

- **In the case of a TO or FLEX takeoff**, the thrust levers must be set to MAX to continue the takeoff
- **In the case of a derated takeoff (TO-1, TO-2, or TO-3):**
 - If the N1 of both engines matches the N1 target, the flight crew can continue the takeoff
 - If the N1 of either or both engine(s) does not match the N1 target, the flight crew must abort the takeoff.

When stabilized in climb (not below 400 ft)

After the aircraft is established on a stabilized climb above 400 ft, the flight crew can reengage the autothrottle as required. For derated thrust or FLEX takeoff, they must confirm that the autothrottle is selected on.

AFM update

The AFM was updated to add a warning in the limitations section for the autopilot. It states that **“Autopilot engagement during takeoff roll can result in premature rotation, possibly leading to tail strike, inability to climb or loss of control. Immediate crew intervention is required.”**



Training

The Operations Training Transmission **A220-OTT-22-00-001 Rev 00** (dated 14-July-2023) recommends that Operators and Training Organizations:

- Reinforce flight crew knowledge on:
 - The importance of reviewing OEBs together during preflight
 - The content of the red OEB “INADVERTENT AUTOPILOT ENGAGEMENT DURING TAKEOFF”
 - The temporary AFM and FCOM 2 takeoff normal procedure “Autothrottle disconnect during takeoff”
- Highlight the importance of the role of Pilot Monitoring. ■



INFORMATION

Further information can be found in the following documents:

- **FOT A220-FOT-22-00-001** dated 09-NOV-22 “ATA 22 – A220 Inadvertent Autopilot Engagement During Takeoff” available on the A220World portal
- **TCCA Emergency AD CF-2022-64**
- **FAA Emergency AD 2022-25-51**
- **A220 Red OEB-001.01 Inadvertent Autopilot Engagement During Takeoff** published on 28-March-2023
- **A220 AFM - Limitations, Autopilot**
- **A220 FCOM – Normal Procedures - Normal takeoff / High Wind Takeoff, Step (3) Autothrottle**
- **A220-OTT-22-00-001 Rev 00** dated 14-July-2023

PRODUCT ENHANCEMENTS

Airbus will introduce the following enhancements to prevent inadvertent engagement of the autopilot when the aircraft is still on the ground and improve flight crew awareness to prevent any errors.

Modification to inhibit autopilot

To prevent autopilot engagement during the takeoff roll, the Primary Flight Control Computer (PFCC) will be upgraded to inhibit AP engagement during takeoff and until 6 seconds after liftoff. This modification will be introduced in PFCC standard 009, planned for Q2 2024.

Enhancement of the autothrottle disconnection logic

The autothrottle disconnect logic is also being updated to address the issues that cause it to disconnect during the takeoff roll. A first set of improvements will be introduced with the next 8A3 avionics software and further improvements are currently being developed.

“CONFIG AUTOPILOT” priority over “AUTOTHROTTLE” aural alert

EICAS software will be upgraded to give higher priority to takeoff configuration warning messages, such as “CONFIG AUTOPILOT”, or when other CONFIG takeoff alerts are posted, even if the AUTOTHROTTLE aural alert is not silenced. This improvement should also be available in the 8A3 avionics software. ■

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Flight crews should be aware of the consequences of inadvertent selection of the autopilot during the takeoff roll, which may lead to a risk of tail strike, inability to climb, runway overrun, and possible loss of control. A220 FCOM procedures were updated and AFM limitations were added to help flight crews learn from the experience of previously reported events and prevent this kind of event from recurring.

This should be reinforced by all operators applying the applicable recommendations, including the need for the flight crew to review applicable OEBs together during preflight and the importance of the Pilot Monitoring role. Product enhancements, modifications, and updates will be implemented as additional safety features that will inhibit autopilot engagement during the takeoff roll, increase the robustness of the autothrottle monitoring, and improve the priority sequencing of aural alerts.

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